WHAT IS CLAIMED IS:

1. A method of measuring a complex dielectric constant of a dielectric, comprising the steps of:

filling a mode generator with a dielectric;

5   inputting an electromagnetic wave to the mode generator;

measuring an electromagnetic wave output from the mode generator; and

calculating a complex dielectric constant based on the electromagnetic wave thus measured.

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2. The method of measuring a complex dielectric constant of a dielectric according to claim 1, wherein the dielectric is a powder-like dielectric,

the mode generator is filled with a gas together with the

15   dielectric,

an S parameter of the electromagnetic wave is measured at the measuring step, and

the calculating step includes a step of calculating a complex dielectric constant of a mixture obtained by mixing the

20   dielectric and the gas in the mode generator based on the S parameter, and

a step of calculating the complex dielectric constant of the dielectric from the complex dielectric constant of the mixture which is calculated and a volume ratio of the dielectric

25   in the mixture.

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3. The method of measuring a complex dielectric constant of a dielectric according to claim 2, wherein the calculation of the complex dielectric constant of the mixture is a calculation of a dielectric constant of the mixture, and the calculation of the complex dielectric constant of the dielectric is a calculation of a dielectric constant of the dielectric.

4. The method of measuring a complex dielectric constant of a dielectric according to claim 3, wherein the dielectric constant of the dielectric is calculated by using one of a logarithmic alligation, an equation of "Lichteneker Rother" and an equation of Wiener.

5. The method of measuring a complex dielectric constant of a dielectric according to any of claims 2 to 4, wherein the calculation of the complex dielectric constant of the mixture is a calculation of a dielectric loss tangent of the mixture, and the calculation of the complex dielectric constant of the dielectric is a calculation of a dielectric loss tangent of the dielectric.

6. The method of measuring a complex dielectric constant of a dielectric according to claim 5, wherein the

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calculation of the dielectric loss tangent of the dielectric is carried out by using an equation of the alligation.

7.   The method of measuring a complex dielectric constant of a dielectric according to claim 1, wherein the dielectric is a dielectric molding having the same section as a section of a closed space of the mode generator,

the mode generator is filled with a gas together with the dielectric,

a resonance frequency, an insertion loss and a half-power width in a resonance mode of the electromagnetic wave are measured at the measuring step, and

a complex dielectric constant of the dielectric molding is calculated, at the calculating step, from the resonance frequency, the insertion loss and the half-power width which are thus measured.

8.   The method of measuring a complex dielectric constant of a dielectric according to claim 7, wherein the calculation of the complex dielectric constant of the dielectric molding is a calculation of a dielectric constant of the dielectric molding.

9.   The method of measuring a complex dielectric constant of a dielectric according to claim 7, wherein the

calculation of the complex dielectric constant of the dielectric molding is a calculation of a dielectric loss tangent of the dielectric molding.

10. The method of measuring a complex dielectric constant of a dielectric according to claim 7, wherein the dielectric molding is columnar.

11. The method of measuring a complex dielectric constant of a dielectric according to claim 2 or 7, wherein the mode generator is a cylindrical resonator.

12. The method of measuring a complex dielectric constant of a dielectric according to claim 2 or 7, wherein the mode generator is a cavity resonator.

13. The method of measuring a complex dielectric constant of a dielectric according to claim 2 or 7, wherein the resonance mode of the electromagnetic wave is a TE_{011} mode.

14. The method of measuring a complex dielectric constant of a dielectric according to claims 1, 2, or 7, further comprising a step of drying the dielectric in the mode generator.

15. The method of measuring a complex dielectric

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constant of a dielectric according to claim 14, further comprising a step of evacuating the mode generator, thereby drying the dielectric.

5   16.   The method of measuring a complex dielectric constant of a dielectric according to claim 1, wherein the mode generator is a waveguide,

the waveguide is filled with a gas or a liquid together with the dielectric,

10   a dielectric constant of a mixture obtained by mixing a powder and the gas or liquid is calculated based on the measured electromagnetic wave at the calculating step, and

a dielectric constant of the powder is calculated from the dielectric constant of the mixture and a volume ratio of

15   the powder in the mixture at the calculating step.

17.   The method of measuring a complex dielectric constant of a dielectric according to claim 16, wherein a dielectric constant of the dielectric is calculated by using

20   one of a logarithmic alligation, an equation of "Lichteneker Rother" and an equation of Wiener.

18.   The method of measuring a complex dielectric constant of a dielectric according to claim 16, wherein the

25   waveguide is a coaxial-type waveguide.

19.   The method of measuring a complex dielectric constant of a dielectric according to claim 16, wherein the waveguide is a rectangular waveguide.

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20.   The method of measuring a complex dielectric constant of a dielectric according to claim 16, wherein the waveguide is a circular waveguide.

10   21.   The method of measuring a complex dielectric constant of a dielectric according to claim 16, wherein the waveguide includes a seal portion for holding the gas or the liquid.

15   22.   The method of measuring a complex dielectric constant of a dielectric according to claim 16, wherein a volume ratio of the powder in the mixture is set to be 0.32 to 0.42 and a frequency of the electromagnetic wave is 0.1 GHz or more.

20   23.   The method of measuring a complex dielectric constant of a dielectric according to claim 17, further comprising the steps of:

measuring respective dielectric constants of a plurality of mixtures in which types of powders are different from each

25   other and volume ratios are equal to each other, and

comparing the dielectric constants of the mixtures, thereby comparing and measuring dielectric constants of a plurality of dielectrics.

5   24.   An apparatus for measuring a complex dielectric constant of a dielectric, comprising:

a mode generator having a dielectric provided therein;

an electromagnetic wave generating analyzer for inputting an electromagnetic wave to the mode generator provided with the

10   dielectric and measuring the electromagnetic wave output from the mode generator in response to the input of the electromagnetic wave; and

a calculating device for calculating the complex dielectric constant of the dielectric based on the

15   electromagnetic wave thus measured.

24.   The apparatus for measuring a complex dielectric constant of a dielectric according to claim 24, wherein the mode generator is a resonator for filling the dielectric and a gas

20   therein,

the electromagnetic wave generating analyzer measures a resonance frequency, an insertion loss and a half-power width in a resonance mode of the electromagnetic wave, and

the calculating device calculates the complex dielectric

25   constant of the dielectric based on the resonance frequency,

the insertion loss and the half-power width.

26.   The apparatus for measuring a complex dielectric constant of a dielectric according to claim 25, wherein the resonator includes:

a first piston provided with a through hole;

a second piston provided opposite to the first piston;

a cylinder for covering the first piston and the second piston, thereby forming a closed space; and

a coaxial cable for inputting and outputting the electromagnetic wave inserted in the through hole.

27.   The apparatus for measuring a complex dielectric constant of a dielectric according to claim 26, wherein an annular groove is formed on a tip portion of the first piston and a tip portion of the second piston.

28.   The apparatus for measuring a complex dielectric constant of a dielectric according to claim 26, wherein an annular conductor plate or dielectric plate is attached to a tip portion of the first piston and a tip portion of the second piston.

29.   The apparatus for measuring a complex dielectric constant of a dielectric according to claim 25, wherein when the dielectric is a powder, the calculating device calculates

a complex dielectric constant of a mixture obtained by mixing the dielectric and the gas in the resonator from the resonance frequency, the insertion loss and the half-power width which are measured, and calculates the complex dielectric constant

5   of the dielectric from the complex dielectric constant of the mixture which is thus calculated and a volume ratio of the dielectric in the mixture.

30.   The apparatus for measuring a complex dielectric
10   constant of a dielectric according to claim 29, wherein the calculation of the complex dielectric constant of the mixture is a calculation of a dielectric constant of the mixture, and the calculation of the complex dielectric constant of the dielectric is a calculation of a dielectric constant of the
15   dielectric.

31.   The apparatus for measuring a complex dielectric constant of a dielectric according to claim 30, wherein the dielectric constant of the dielectric is calculated by using
20   one of a logarithmic alligation, an equation of "Lichteneker Rother" and an equation of Wiener.

32.   The apparatus for measuring a complex dielectric constant of a dielectric according to claim 29, wherein the
25   calculation of the complex dielectric constant of the mixture

is a calculation of a dielectric loss tangent of the mixture, and the calculation of the complex dielectric constant of the dielectric is a calculation of a dielectric loss tangent of the dielectric.

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33. The apparatus for measuring a complex dielectric constant of a dielectric according to claim 32, wherein the dielectric loss tangent of the dielectric is calculated by using an equation of the alligation.

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34. The apparatus for measuring a complex dielectric constant of a dielectric according to claim 25, wherein when the columnar dielectric is a molding, the calculating device calculates a complex dielectric constant of the dielectric molding from the resonance frequency, the insertion loss and the half-power width which are measured.

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35. The apparatus for measuring a complex dielectric constant of a dielectric according to claim 34, wherein the calculation of the complex dielectric constant of the dielectric molding is a calculation of a dielectric constant of the dielectric molding.

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36. The apparatus for measuring a complex dielectric constant of a dielectric according to claim 34, wherein the

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calculation of the complex dielectric constant of the dielectric molding is a calculation of a dielectric loss tangent of the dielectric molding.

5   37.   The apparatus for measuring a complex dielectric constant of a dielectric according to claim 25, wherein the resonance mode of the electromagnetic wave is a TE_{011} mode.

38.   The apparatus for measuring a complex dielectric 10   constant of a dielectric according to claim 25, further comprising a vacuum device for evacuating a closed space in the resonator to dry the dielectric in the resonator.

39.   The apparatus for measuring a complex dielectric 15   constant of a dielectric according to claim 34, wherein the resonator is filled with a columnar dielectric molding having the same section as a section of the closed space and a gas.

40.   The apparatus for measuring a complex dielectric 20   constant of a dielectric according to claim 25, wherein the dielectric and the gas are filled in a closed space having an almost circular section which is formed in the resonator.

41.   The apparatus for measuring a complex dielectric 25   constant of a dielectric according to claim 24, wherein the mode

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generator is a waveguide filled with a mixture obtained by mixing a powder of which complex dielectric constant is to be measured and a gas or a liquid.